

Blake (C. J.)

LATE CONTRIBUTIONS
TO
AURAL SURGERY.

BY
CLARENCE J. BLAKE, M.D.

BOSTON.

READ (AT THE ANNUAL MEETING OF THE MASS. MED. SOC.) MAY 24, 1870.



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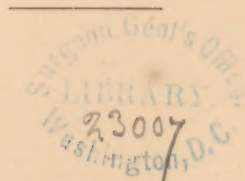
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PREFATORY NOTE.

It has been the writer's intention to give a short summary of improvements in instruments for the diagnosis and treatment of diseases of the ear during the last few years. So much has been done in this direction, that more space might have been advantageously occupied in its consideration, while to record the advances in the knowledge of the Anatomy, Physiology and Pathology of the ear for the same period of time, would require the compilation of a voluminous work, far exceeding the limits of the following article.

20 Beacon Street,
Sept. 1, 1870.

LATE CONTRIBUTIONS TO AURAL SURGERY.

THE principal subject of this paper is one which has, as yet, received comparatively little general attention in this country.

The treatment of diseases of the ear, aside from general practice, has had few advocates, while the study of the subject has hardly kept pace with that of other branches of surgery, and it is only very lately that opportunities for instruction in otology, and for clinical study, have been afforded by our medical schools, and that we have had suitable text books for the use of students. The appointments of qualified lecturers in the New-York and Philadelphia Hospitals, and in the Harvard Medical School, have supplied the former, and the revised edition of Toynbee, and Dr. Roosa's translation of v. Troltsch, the latter want.

Aural surgery, or the surgical treatment of affections of the ear, considered as a separate branch of the general science, is of very recent growth. Thirty years ago, the knowledge of the pathology and treatment of diseases of the ear was very limited, and to-day it is far behind those other departments of medicine which have received especial attention.

This is the more surprising, as the organ implicated plays so important a part in our daily life, and is the channel through which we receive many of the impressions which form and mould the character. As a special sense, hearing

ranks only second to sight in importance, and a loss of it entails to a great degree the loss of everything that serves to make life useful and enjoyable.

The rarity of affections of the ear cannot have been the ground for the neglect of surgical interference in their treatment; this is to be traced rather to the situation of the more important parts of the organ, at the termination of a long narrow canal and in close relation to so vital a structure as the brain; to the delicacy of the functional apparatus of hearing, and to the fact that diseases of the ear are by no means so patent as those of the eye for instance, where a slight functional disturbance excites immediate attention and calls for speedy relief.

Until Toynbee opened the way for a more thorough study by numerous and careful observations upon the pathology of diseases of the ear, the general treatment of this class of affections was for the most part empirical, and the surgery was almost entirely confined to the removal of foreign bodies from the meatus, and operations upon the auricle.*

Contemporaneously with Toynbee, Wilde of Dublin contributed largely towards increasing the knowledge of this subject, by founding an aural clinic and instituting careful examinations of his cases, and so aided in laying the foundations of the future science of otology. The labors of Toynbee and Wilde gave an impetus to scientific investigation on the continent, and in the large universities numerous observers turned their attention to a field which had long been culpably neglected, and which, as they advanced, they found to promise a rich harvest. Nor has this promise been otherwise than fulfilled, for now almost every day brings the news of some further discovery in the anatomy or physiology of the organ of hearing, some further contribution to

* The illustrations in most of the older works upon aural practice are confined principally to different forms of the ear trumpet.

our knowledge of the pathology of its diseases, or the gratifying assurance that the list of so-called incurable affections has been still further diminished. Up to within a few years, the only methods of examining the ear were by means of a probe, or by placing the patient in such a position that sunlight or the light of a lamp should shine into the meatus. The use of the probe was obviously objectionable, and that the simple illumination employed gave but an imperfect idea of the condition of the membrana tympani is shown in the illustrations of some of the earlier authors.*

Kramer and Itard employed a bi-valve speculum for the purpose of dilating the meatus and concentrating the light upon the membrana tympani; this instrument is still in general use, but is by no means so efficient as the specula of Toynbee, Gruber, v. Tröltsch and Politzer, which are rapidly taking its place. In using Kramer's bi-valve speculum, the vision is obstructed by the hairs which project through the openings between the valves, and, moreover, in the anxiety to obtain a clear view, the observer may forget the delicacy of the integument lining the meatus, and exert a pressure liable to excite inflammation.

Gruber the elder, of Vienna, first employed a simple conical tube of metal in place of Kramer's instrument, and the specula since constructed are merely modifications of this. Politzer has retained the form of the original almost exactly, but has substituted hard rubber for metal, on the grounds of cheapness and lightness; the dark ground throws out the coloring of the membrana tympani more distinctly, and it is not necessary to warm the instrument before introducing it, as is often required in the case of the metal tubes.

It was not till specula had been some time in use that any change was made in the method of illumination.

* Compare Frank's *Ohrenheilkunde*, p. 297.

In 1855, v. Tröltsch devised a concave mirror, for the purpose of reflecting natural or artificial light, and concentrating it within the speculum. The orifice in the centre of the mirror is for the convenience of the surgeon, the eye being brought in a direct line with the focal point. This mirror, though original with v. Tröltsch, had been suggested by a Westphalian surgeon—Dr. Hoffman—some fourteen years previously, but had not received the attention which it merited.

Still earlier, in 1834 namely, Bonnafont had constructed a tubular reflector to be used with Kramer's speculum. It consisted of a copper tube 20 c.m. long, and 15 m.m. in diameter, containing three lenses. Towards the lower end, and placed diagonally across the tube, was a centrally perforated mirror to receive the light concentrated upon it from a funnel-shaped cylinder, placed at right angles to the tube, and reflect it into the meatus. This instrument of Bonnafont's has served as the model for all of that class of reflectors receiving the light from a direction at a right angle to the long axis of the instrument.

Of the modifications of Bonnafont's reflector, Leiter's and Hinton's are perhaps the best. The one made by Leiter, of Vienna, is very simple in its construction; it is of hard rubber, dispenses with the funnel-shaped reflector, and can be fitted at its lower end with specula of different sizes. The other, designed by Mr. Hinton, of London, is a very elegant instrument; with it two persons are enabled to make an examination at the same time, and it is therefore valuable for purposes of demonstration.

Since the first attempts at obtaining a clear illumination of the membrana tympani, the idea of facilitating the examination of that structure by magnifying has been a favorite one with otologists. The instrument of Mr. Hinton does this to a slight degree, and Weber, of Berlin, has construct-

ed a lens speculum with this object in view. The speculum is fastened at one end of a metal frame, and the reflector at the other, the lens being placed just in front of the mouth of the speculum. Aside from the difficulty of adjusting the lens, the instrument, taken as a whole, is clumsy in construction, and requires considerable experience in its use.

All of the tubular reflectors and lens specula serve only for examination, and are of no immediate use when we come to operate upon the membrana tympani or within the middle ear. In this case we may employ either the direct rays of the sun, or artificial light, or the concave mirror attached to a spectacle frame or to a band passing around the head, or the instrument of Mr. Ritchie, to which I wish to draw especial attention.

In all operations within the ear, a clear and steady illumination is of the first importance. Where direct light of any kind is employed, a difficulty presents itself in that the ear to be operated upon, being towards the source from whence the light comes, the operator must so place himself that he may obtain an unobstructed view, and still not cast a shadow upon the field of operation; and this is by no means an easy matter. The concave reflector obviates this difficulty to a certain extent, but not entirely. The light must be reflected from the mirror held in the hand or fixed upon the head in the manner described, and the hand of the operator coming between the mirror and the mouth of the speculum, necessarily casts a shadow. In addition to following the point of his instrument, the surgeon must give a due consideration to the illumination, and keep his head and the mirror steadily in proper position; and, moreover, in order to get the clearest view, it is necessary to look through the orifice in the centre of the mirror, so that only one eye can be used: the natural result is that the stereoscopic effect is lost, and it is very difficult to estimate the distance between the point of the instru-

ment and the eye.* Dr. Edward H. Clarke employs a mirror attached to a stand by a universal joint, for reflecting sunlight from a window into the room, and then by means of a lens of about two inches focus throws the light through a silver speculum into the meatus. By this means the degree of illumination can be very easily regulated, and a strong light can be thrown at will upon any part of the membrana tympani which it is desired to examine.

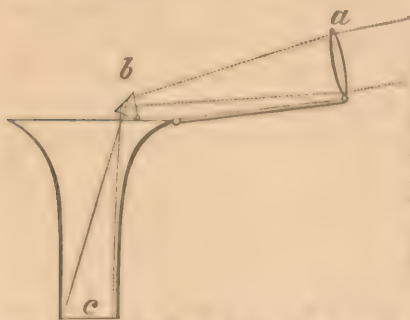
For the sake of dispensing with the reflector, any attempt to bring the light between the operator and the patient would be useless; but to bring the light from one side and reflect it over the rim of the speculum, leaving the operator a clear field, and relieving him of the care of managing the illumination, would greatly facilitate the performance of the more delicate operations upon and within the membrana tympani, especially those requiring time as well as care. On stating the requirements of the case to Mr. Edward S. Ritchie of this city, one of the ablest mechanics in the country, he devised the instrument to which I have given his name, and which, while exceedingly simple in its construction, perfectly fulfils the purpose for which it was intended.



It consists of a hand rubber speculum (Politzer's) of the largest size, fitted with a metallic rim, to which is attached a revolving prism and an arm, bearing at its outer end a lens of about an inch focus; this arm is moveable, but sufficiently firm to remain fixed at any angle at which it is placed. The prism is just within the focal distance of the lens,

* In the *Monatsschrift für Ohrenheilkunde*, December, 1869, Dr. DeRossi, of Genoa, under the title "L'Otoscope binoculaire," describes a concave reflector constructed on the principle of the binocular ophthalmoscope.

and its incident face is armed with a small metal shield, having an opening in the centre corresponding in its short diameter to the diameter of the pencil of light falling upon it from the lens.



The advantage of the prism over a mirror or other reflecting surface is, that we have almost total reflection, and but little of the light concentrated upon the prism by the lens is lost.

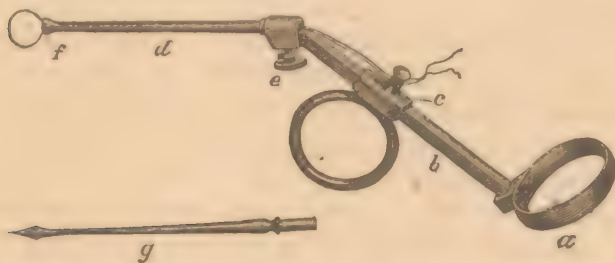
In operating, an assistant is required to draw the auricle upward and backward, and keep the speculum in position, with the pencil of light upon the opening in the shield of the prism. It is not claimed for this instrument that it at all supersedes the head mirror of v. Trölsch, but it is certainly of great advantage in the more complicated operations, where a steady and uniform illumination is indispensable. The instrument, as a whole, weighs only about one hundred and fifty grains, and can be made much lighter; so that when once firmly inserted in the meatus, it remains in position, and there is no necessity for holding it nor fear of its slipping out of place during the operation. I have had ample opportunity for testing it, and find, as before intimated, that it greatly facilitates the performance of delicate operations.

As a result of inflammation of the middle ear, especially where it has occurred in childhood, we sometimes find adhesion of the lower end of the malleus to the promontory, and also synechiæ extending from the membrana tympani to various points on the wall of the tympanum and to the ossicula, sometimes forming quite a network. These adhe-

sions greatly impair the functional activity of the sound-transmitting apparatus, by tying down the membrana tympani and destroying its vibratory power, and preventing movement of the ossicula. In 1864, Dr. Sigle, of Stuttgart, described an instrument of his own invention, the purpose of which was to facilitate the diagnosis of the presence of synechie, implicating the membrana tympani. It consists of a hard rubber speculum, the mouth of which forms a circular chamber, closed at its outer end by a thin plate of glass set at an angle of about 50° to the long axis of the speculum. The chamber has an opening in its floor communicating with a flexible tube having a mouth-piece. The speculum being pressed tightly into the meatus, the air is exhausted by suction through the tube, the air in the middle ear presses the membrana tympani outward, and those points at which there are adhesions are represented by slight depressions upon the general surface. By this means we are enabled not only to make an accurate diagnosis, but also to determine at what point to apply the knife for the purpose of liberating the membrane.

Among the cases of disease of the ear which most frequently apply to the general practitioner for relief, are those forms of inflammation of the middle ear and the meatus, accompanied by a more or less offensive discharge and liable to the complication of aural polypi. Whatever may be the origin of these growths, their extirpation is indispensable to the successful treatment of the affection which they either originate or accompany. Of the means for effecting this purpose, the forceps, wire snare, and caustic applications, are most frequently employed. The forceps should never be used unless we are satisfied as to the point of origin of the polyp, and that none of the important structures of the ear are implicated in the growth. The satisfaction incident to the clean extraction of a large polyp, would be very much

diminished by finding a portion of the membrana tympani or one of the ossicula attached to it. Of wire snares, Sir William Wilde's is the one described in all the later text-books, and most generally employed. In adding one more to the modifications of this instrument, I have endeavored to obviate a difficulty which I had found in its use, and also by a slight change to adapt it to another purpose. In Mr. Wilde's snare, the bar which carries the slide and the arm which supports the wire are in one piece. To slip the wire loop over a small polyp in the meatus when it grows from one of the side walls, it is necessary either to turn the whole instrument or else to twist the wire loop upon itself. The former is inconvenient; in the latter case, where the loop is drawn taut, it tends to return to its original position, and may either slip over the polyp or cut it off obliquely, leaving a larger portion than is desirable for extirpation by the caustic. The wires running upon the outside of the arm are apt to be in the way if slackened, and in a narrow meatus may cut into the integument if drawn upon.



For the fixed arm a moveable tube of German silver (*d*) is substituted. This tube expands at the outer end into a flattened head (*f*), having two openings for the passage of the wire; the inner end of the tube fits into a broad band on the slide bar (*b*). The ends of the wire passing down the tube are fastened to a pin on the upper part of the slide (*c*)

below which is a ring by which traction can be made. The slide is substantially the same as in the snare of Dr. E. H. Clarke.* When ready for use, the metal tube, and with it the loop, can be turned in any desired direction, and firmly fixed in place by means of the small set screw (*e*). By unscrewing the thumb-ring (*a*), removing the slide and the tube and inserting in the place of the latter the lance-headed needle (*g*) employed for performing paracentesis, we have a myringotome possessing the advantage of enabling us to adjust the cutting edges according to the direction in which it is desired to make the incision.

In no one section of aural surgery have such rapid advances been made as in the diagnosis and treatment of affections of the middle ear, and much still remains to be done. A glance at the anatomy of this portion of the organ of hearing shows us the important part which it plays in transmitting the vibrations received through the meatus to the internal ear, and an examination into the delicacy of structure and accurate adaptation of the several parts to the office which they have to perform, shows in what manner a slight lesion may result in extensive impairment of hearing.

Aside from the effects of primary affections of the membrana tympani, the sequelæ of acute and chronic inflammation of the middle ear are manifold, and in a large proportion of the adult cases seeking relief from impairment of hearing and the accompanying subjective symptoms, the existing cause is traceable to structural lesions, the result of an inflammatory process occurring perhaps years previously.

It is in this class of cases in addition to treatment instituted by means of catheterization by the Eustachian tube, that we most often are obliged to have recourse to direct surgical

* Observations on the Nature and Treatment of Polypus of the Ear. Boston: 1867. P. 58.

interference through the meatus, with the hope of anything like permanent relief to the patient, and in this direction it would seem that the most important improvements in aural surgery during the next few years are to be made.

The operation of paracentesis of the membrana tympani is by no means of modern origin; its application, however, has of late been very much extended and the limit of cases within which it may be employed to advantage has been more accurately determined. In 1649, Riolan propounded the question as to the advisability of destroying a portion of the membrana tympani in cases of deafness; this proposition was founded upon his observations of a case where the hearing was restored by an ear-spoon having been forced into the ear, tearing the membrane and fracturing the ossicula. The value of Riolan's observations and suggestion was overlooked, however, and intentional laceration of the membrana tympani considered reprehensible. So strong was the feeling on this subject that, in 1750, Cheselden, who had been following out the experiments of Willis and Valsalva upon dogs, was prevented by popular outcry from operating upon a criminal condemned to death.* The credit of the first successful operation has been given to several surgeons, among whom the name of Sir Astley Cooper ranked first, but it is now pretty clearly established that a travelling charlatan named Eli employed it empirically for the cure of deafness in Paris, in 1760, but met with but a moderate degree of success.

In 1801, Cooper followed the publication of his observations upon the effects of perforations of the membrana tympani upon the hearing, by reports of successful cases in which he had operated, propounding closure of the Eustachian tube as the *single* indication for the operation. Subsequent cases did not confirm the hopes raised by the first

* Schwartz: Archiv für Ohrenheilkunde, Bd. II., Hft. I.

results, and, dreading the effect upon his reputation and discouraged by ill success in a large proportion of the patients who flocked to him from all parts of Europe, he finally abandoned it. His first publication, however, had attracted universal attention upon the continent, innumerable instruments for attaining the desired end were invented, and there was a general and indiscriminate cutting, tearing and trephining of tympanic membranes from one end of Germany to the other.

Himly, of Göttingen, put an end to this reckless experimenting by proving that the operation was by no means either harmless or a universal remedy for deafness, and could only be of service in certain cases, very few in-number; and it shortly fell into more disrepute than it deserved. But science was by no means a loser; the haphazard operators became careful observers; the numerous cases operated upon supplied ample material, and the first step was taken towards a knowledge of the functions of the membrana tympani and ossicula, and an appreciation of the importance of the study of their pathology. As a result, the indications for this operation were more clearly determined, and later observers have greatly enlarged the list of cases in which paracentesis may be resorted to as the readiest means of relief. Obstructions of the Eustachian tube, thickening of the membrana tympani, and the accumulation of blood, pus and mucus in the tympanum, were considered the sole indications for the operation by the majority of authors, up to within ten years. Frank, however, in his *Lehrbuch der Ohrenheilkunde*, 1845, lays particular stress upon its diagnostic value in cases of thickening of the membrane and occlusion of the Eustachian tube as a means of determining the character of the contents of the tympanum.* The employment of bougies for the

* Frank: *Praktische Anleitung zur Erkenntniss u. Behandlung der Ohrenkrankheiten*. Erlangen: 1845. Pp. 74, 75.

relief of obstruction of the Eustachian tube* obviated the necessity for the more serious procedure, and limited it to cases of atresia of that passage; and Gruber, of Vienna, in an article on Myringotomy, 1863,† contributed greatly to extending its applicability, by giving four indications in addition to those already enumerated, namely—partial ossification (calcareous deposits) of the membrana tympani when accompanied by loss of hearing and subjective noises; cicatrices which interfere with the function of this structure; attenuation of the membrana tympani when in consequence of the loss of its resiliency it is pressed inwards and excites subjective symptoms; abnormal adhesions of the structures within the tympanum, when their character and extent can be accurately determined, and the operation will open the way for their removal.

In the purulent inflammation of the middle ear frequently accompanying scarlet-fever or measles, the operation, if resorted to in time, may be the means of warding off the disastrous results which entail a greater or less degree of permanent deafness, and contribute a goodly percentage to the inmates of our deaf-mute institutions. In the natural course of the disease, that is in the severer cases, as a general rule the pressure of the confined discharge upon the inflamed membrana tympani gradually causes thinning and rupture, leaving an opening which enlarges as the inflammation and discharge continue, until the greater portion of the membrane may be destroyed and such changes take place within the tympanum as to result finally in a condition of things which it is beyond the present degree of surgical skill to remedy. A timely use of the knife would relieve the pres-

* Schwartze, l. c.

† Allg. Wiener Med. Zeitung, 1863.

sure upon the membrane and within the tympanum and by permitting an early escape of the discharge would favor resolution.

Quite recently considerable attention has been drawn to the value of paracentesis in cases of accumulation of excessive mucous secretion within the tympanum by Dr. Adam Politzer,* Prof. Moos,† Mr. Hinton‡ and others, and their observations show a much greater frequency of such cases than was generally supposed.

The accumulation of the secretion in the tympanum is the result of an inflammation in that cavity accompanied or followed by diminished permeability of the Eustachian tube, the fluid is often very thick and tenacious, and does not easily make its escape by the natural channel down into the throat; by its pressure upon the membrana tympani it interferes with the functions of the sound-transmitting apparatus and greatly diminishes the hearing power, while a corresponding pressure upon the base of the stapes and the membrane of the fenestra rotunda, gives rise to ringing, singing or rushing sounds, and reflexly causes vertigo, nausea and even vomiting. Catheterization of the Eustachian tube or the use of Politzer's air douche, give but partial relief, the inflammatory process having generally decreased the patency of that passage in a greater or less degree, so that exit is permitted to but a small portion of the fluid, and that which remains serves to keep up the irritation and favor a still further secretion. A free incision through the membrana tympani enables us to force the secretion outwards into the meatus by injecting air through the Eustachian tube, and this procedure

* Wiener Med. Wochenschrift, 1867.

† Archiv. of Ophthalmology and Otology, 1870.

‡ Guy's Hospital Reports, 1869.

is generally followed by an immediate increase in hearing and freedom from the distressing subjective symptoms.*

The opening in the membrane closes readily within three or four days, and it is sometimes necessary to repeat the incision four, five or even six times. Catheterization or the simple air douche should always accompany the operation, and it is well to continue it for some time after the tendency to excessive secretion is diminished, in order to restore the membrane lining the tympanum to a healthy condition, and secure a sufficient permeability of the Eustachian tube to guard against the liability of a recurrence of the trouble. The fact above mentioned concerning the readiness with which incisions through the membrana tympani become closed brings us to the consideration of a question which has long occupied the attention of aural surgeons, namely—the possibility of establishing a permanent opening into the tympanic cavity.

Where the sound-transmitting apparatus no longer fulfils its office, and the membrana tympani remains intact, it presents an obstacle to the passage of sonorous vibrations. In such case, if there is no contra-indication, such as an affection of the labyrinth or of the vestibular attachment of the stapes, an opening through the membrana tympani would allow the sound waves to pass into the tympanum, and, falling upon the base of the stapes, to be transmitted to the auditory nerve. The instruments first employed for paracentesis were either fine trochars, needles, stilets or knives of various shapes; it was soon found that the openings closed completely, and that the relief gained by the operation was only temporary. Trephines were then resorted to, but with no better success, and the excision of even a large portion of the mem-

* Mr. Toyubee proposed the removal of fluid from the tympanum by means of a small syringe introduced through the membrana tympani. Trans. Am. Otological Society, 1869.

brane did not prevent subsequent closure of the opening. Bonnafont followed trephining by cauterization of the edges of the wound and by the introduction of bougies and metallic canulæ, in one case allowing a canula to remain forty-five days; within six days after its removal, however, the size of the opening had so far diminished that it was impossible to reinsert the tube.* Perforations were also made with caustics, but closed with equal rapidity, and this method was found objectionable on account of the danger of exciting severe inflammation.

In 1859, Erhard proposed the substitution of a wire heated by an electric current, for caustic, and the white-hot trechar. Voltolini, who had occupied himself with the application of galvano-caustic in the treatment of diseases of the throat and for the cauterization of aural polypi, developed the idea, and in December, 1867, published an account of his first operation and the instrument employed.†

About a year later I had the opportunity of witnessing in Vienna the experiments of Drs. Politzer and Chimani and Prof. Moos, with galvano-caustic. The instrument was the simple point of fine platinum wire used in the cauterization of granulations and polypi. The object to be attained, a perforation made quickly and painlessly, which should remain open without further interference. Three cases were selected from patients in the aural clinic of the Garrison Hospital No. 1, and submitted to the experiment. The platinum point, being pressed against the membrane in the anterior inferior segment, was quickly brought to a white heat by a battery consisting of two Grove's cells. Instead of passing painlessly through, however, in each case the pain caused was so severe that further attempts were abandoned.

* Bonnafont: *Traité théorique et pratique des Maladies de l'Oreille*. Paris: 1860. P. 375.

† *Monatschrift für Ohrenheilkunde*, 1867, No. 3.

Four days later I examined one of the patients and found an acute myringitis on both sides, and it is not improbable that the result was the same in the two other cases, judging from the fact that the pain and congestion following the application of the heated wire was the same in all.

Dr. Wreden, of St. Petersburg, proposed, in addition to cutting out a large piece of the membrane, the removal of a portion of the lower end of the malleus, and constructed two very ingenious instruments for effecting his purpose. The one for cutting away the membrane consists of a handle supporting at an angle of about 70° a knife, the blade of which is made to describe a perfect circle by pressure upon a slide moving in the handle. The other, for excision of the bone, is a pair of stout shears for cutting, and below them a light pair of forceps for seizing and extracting the excised portion: both slide in a tube after the manner of the branches of the lever-ring forceps used for the extraction of polypi.

In the comprehensive and valuable work upon aural surgery by Dr. Jos. Gruber, of Vienna, just published, the author describes an instrument of his own, to which he gives the name Myringectome, and which serves not only for cutting away a portion of the membrane, but also for Wreden's operation of Sphyrotomy. It is modelled upon the principle of the lithotrite, the end of the stationary blade being circular and fenestrated; into the opening the end of the moveable blade fits like a punch. In operating, a slit is first cut through the membrana tympani with a knife or paracentesis needle, the lower blade of the myringectome introduced through the opening and brought in contact with the inner surface of the membrane; the upper blade, being forced downward by means of a small screw, punches out a circular piece which may be extracted between the blades of the instrument. This procedure may be repeated until an opening of the desired size is obtained.

A short time before his experiments with galvano-caustic, Dr. Politzer had succeeded in establishing a permanent opening in the case of a woman who had suffered from acute purulent inflammation of the middle ear, accompanied by perforation of the membrane. The inflammation subsided, the discharge ceased, and the opening into the tympanum remaining, she was able to hear distinctly. Subsequently, however, the opening became closed by cicatricial tissue and the hearing greatly diminished. While in this condition she applied to Dr. Politzer, who made an incision through the cicatrix, dilated it by means of a sea-tangle tent, and then inserted a small hard rubber tube, having a groove cut in it for the reception of the edges of the wound.

Forty-eight hours after the operation, the tube or eyelet was firmly in place, the edges of the opening having closed around it. Before the operation a test watch was heard only when brought in contact with the ear; the same watch was now heard at a distance of nine inches. This improvement continued gradually to increase during the next six months, at the end of which time the hearing was very nearly normal.* The circumstances of Dr. Politzer's case greatly favored success. The membrana tympani was at no point adherent to the opposite wall of the tympanum, nor was it particularly concave; the eyelet was inserted in a thin elastic cicatrix formed by the outer and inner coats of the membrana tympani, and not in a membrane thickened by an old inflammatory process and rich in bloodvessels, and the meatus admitted a large sized speculum. We cannot expect to find equally favorable conditions in all the cases to which this operation is applicable. The

* An account of the operation, together with the substance of Dr. Politzer's article upon the subject of permanent artificial openings in the membrana tympani, was published in the *Boston Medical and Surgical Journal* of March 25th, 1869, to which I would refer for a fuller explanation of the method of procedure.

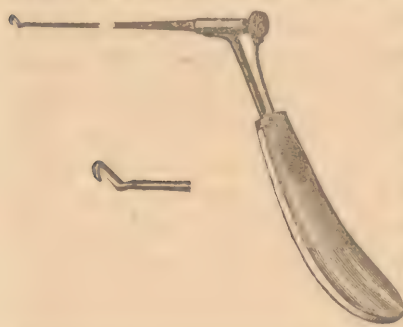
eyelet must necessarily project into the tympanic cavity, and as the distance from the promontory to the membrana tympani is only about 3 m. m., a very slight concavity of the latter would oblige us to choose as the point for insertion a portion of the membrane corresponding to a recess in the opposite wall, either the anterior inferior segment near the opening of the Eustachian tube, or posteriorly below the incus and near the periphery, if we would not run the risk of having the inner end of the eyelet come in contact with the tympanic wall; in which case closure of the opening by secretion would be the least evil which we might expect. Where the malleus is in contact with the promontory, the difficulty is still greater, and it may be necessary to cut the manubrium free from the promontory to which it is adherent, as preliminary to the insertion of the eyelet.

Subsequent observation of Dr. Politzer's case developed a very interesting fact. Five months after the operation it was found that the eyelet which had been inserted near the malleus had moved in the direction of the radiating fibres of the lamina propria, and lay close to the periphery of the membrane, its outer end resting on the posterior wall of the meatus. This observation, in addition to its physiological interest, is of practical importance and adds another complication to Politzer's operation; for, knowing that if inserted near the centre of the membrane it will certainly in course of time reach the periphery by the shortest course, the eyelet must be so placed that in its wandering the inner end may not come in contact with the descending process of the incus or any of the projecting parts of the tympanic wall. Notwithstanding the difficulties besetting this operation, and the fact that though performed with all judgment and delicacy a favorable result cannot be insured on account of the liability of subsequent inflammation and stoppage of the opening in the eyelet, we should not hesitate to resort to it when there

is a prospect of success, because there are so many cases where the establishment of a permanent opening is the only means of which we have at present any knowledge whereby the hearing may be restored, or the patient freed from subjective symptoms, which are sometimes so severe as to entirely preclude mental labor and even induce insanity.

The operations confined to the cavity of the tympanum are very few in number. Of these, the removal of polypi and of adhesions, as already mentioned, and tenotomy, are the most important. In consequence of long continued closure of the Eustachian tube, the air within the tympanum is gradually absorbed, and the pressure of the atmosphere externally forces the membrana tympani inwards and maintains it in that position: the tensor tympani muscle is relaxed and finally becomes retracted so that even after the permeability of the Eustachian tube has been re-established, the membrane, held by the muscle, retains its abnormal position: it is in this condition that the operation of tenotomy is applicable.

Weber's tenotome* closely resembles the knife which Wreden employed for the first part of his operation, except that for the knife blade, a small hook with a cutting edge is substituted. An opening is made through the membrane in front of the malleus, and the hook introduced and caught



over the tendon of the muscle close to its insertion. By operating the slide in the handle of the instrument, the hook is made to describe a quarter of a circle, and cut through the tendon. From operations performed with Weber's instrument upon the cad-

* Monatschrift für Ohrenheilkunde, December, 1868.

aver, I should question the advisability of employing it upon the living subject. Unless handled with the greatest care there is apt to be extensive laceration of the membrane, and the shape of the hook is such that considerable force is sometimes required before the tendon can be divided.

Politzer has proposed hermetically closing the meatus in cases of retraction of the tensor tympani, when there is passage for air through the Eustachian tube. The meatus is tightly plugged with a wad of cotton wool soaked in oil or smeared with simple cerate, which is allowed to remain twenty-four hours at a time; the air between the plug and the membrana tympani is rapidly absorbed, and the air within the tympanum exerts a steady pressure outwards. In many cases this simple procedure is very effectual in relieving the tension of the muscle and restoring the membrane to its proper position.

Since the first use of the catheter, introduced through the nostril,* the method of treatment of diseases of the middle ear through the Eustachian tube, and the treatment of affections of the Eustachian tube itself, has remained very much the same.

Since Cleland's time the catheter has passed through divers modifications, which it would be superfluous to notice here. The instrument, in its present form, serves not only for diagnostic but also for therapeutic purposes. By its use in connection with the otoscope, we are enabled to determine the condition of the Eustachian tube and middle ear, and diagnosticate the existence of small openings in the membrana tympani. Through it we may introduce medicated solutions and vapors, and where the condition of the passage demands it, bougies for purposes of dilatation—the small catgut, laminaria and the finer sizes of the French olivary bougie

* By Cleland, 1741.

being most commonly employed. Of these, the latter is preferable, as it is passed more readily than the cat-gut, while the degree to which the laminaria will dilate is very variable; and there are cases on record where laminaria bougies have broken in the Eustachian tube, an accident the possible results of which we cannot contemplate without dread. In injecting medicated solutions through the catheter, it is a question as to how much of the fluid reaches the middle ear, though the quantity injected through the catheter at different times may be the same: a varying proportion runs down into the throat, according to the position of the beak of the instrument and the degree of permeability of the Eustachian tube.

With medicated vapors the same question holds good, and it is with the view of furnishing a reliable means of medication per tubam that Weber has devised the double catheter described in the fifth number of the *Monatschrift für Ohrenheilkunde*, 1868, and to which he gives the name "pharmacokoniantron." A silver catheter being introduced in the usual manner, a small flexible catheter, having a lateral opening at the beak, is passed through it, up the Eustachian tube and into the tympanum. At the outer end of the flexible catheter is a mark corresponding to the lateral opening in the beak. With this for a guide the opening can be turned in any desired direction, and the fluid introduced into the catheter be ejected in the form of a fine spray by means of air forced in with a balloon. As a substitute for catheterization, which is sometimes impossible, and always disagreeable to the patient, Dr. Politzer introduced the use of a rubber balloon, having a short curved beak attached to it by a flexible tube; this being passed into the nostril and the alæ closed upon it by the thumb and forefinger of the left hand, the patient is made to swallow; at the moment of contraction of the muscles of the pharynx the balloon is compressed. The air which is forced

in at the nostrils cannot make its exit by the same passage, and cannot escape down the throat; it must, therefore, pass up the Eustachian tube and into the tympanum. This constitutes one of our most valued means of treatment at the present time.

In addition to local treatment in affections of the middle ear, a due attention to the condition of the throat and nasal passages is often of equal importance. For the purpose of making applications to the naso-pharyngeal space, and as a substitute for the nasal douche, which sometimes cannot easily be borne, and does more harm than good in such cases, Leiter, of Vienna, has constructed the atomizer, represented in the accompanying woodcut. The instru-



ment is of hard rubber and consists of a tube *b*, enclosing a smaller tube which communicates with the dip-pipe *c*. At *d*, a flexible tube with double bulbs is connected, by which air is forced into the atomizer. At *e*, mouthpieces of different shapes can be attached by screwing them on to the tube, and by varying the position of the openings in the mouthpieces the jet

of spray can be turned in any direction. By removing the mouthpiece a stream of water can be substituted for the spray. The whole apparatus fits like a stopper into the bottle *a*, containing the medicated solution. With the mouth-piece represented at *g*, applications may be made not only to the upper part of the pharynx, through the mouth, but also to the larynx and vocal cords.

The consideration of diseases of the labyrinth, and in this connection of the experiments of Brenner and others in the application of the electric current to diagnosis and treatment of labyrinth affections, though exceedingly interesting, would of necessity be lengthy, and moreover would scarcely come within the scope of this communication. The same may be said of the different forms of parasitic growth in the external meatus, and either subject alone would afford material for a separate paper.

